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(21)Application number : 06-091304 (71)Applicant : MATSUSHITA ELECTRIC  
IND CO LTD  
(22)Date of filing : 28.04.1994 (72)Inventor : HORIUCHI MAKOTO  
OZAWA MASATAKA  
KOYAMA KAZUTAKA  
TAKEDA MAMORU

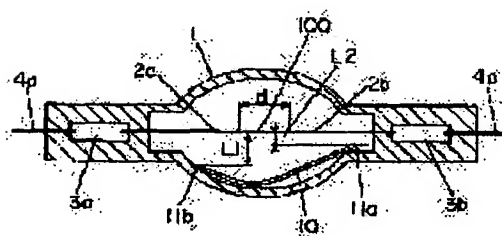
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## (54) HIGH PRESSURE DISCHARGE LAMP

### (57)Abstract:

PURPOSE: To improve the starting property of a lamp without sealing a radioactive material or repeatedly applying a high voltage by adding and sealing a conductor piece into a light emitting tube in a high pressure discharge lamp having a pair of electrodes arranged opposite to each other.

CONSTITUTION: A tungsten wire 10 is added and sealed into a light emitting tube 1, and the tungsten wire 10 is arranged so that the relation between the distance L1 between the first end part 11a of the tungsten wire 10 and a virtual straight line 100 and the distance (d) between electrodes is  $L > d$ . Thus, corona



discharge is generated in the end parts 11a, 11b of the tungsten wire 10, and the charged particles are abundantly supplied into the light emitting tube 1 to enhance the conductivity between electrodes 2a, 2b. Consequently, a main discharge can be induced between the electrodes 2a, 2b with a low voltage.

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3. In the drawings, any words are not translated.

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**CLAIMS**

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[Claim(s)]

[Claim 1] the electrode of the couple by which opposite arrangement was carried out -- having -- the interior of an arc tube -- a conductor -- the high-pressure discharge lamp characterized by enclosing a piece

[Claim 2] a conductor -- the high-pressure discharge lamp according to claim 1 characterized by consisting of material to which a piece makes a tungsten a principal component

[Claim 3] at least one kind of metal halogenide encloses with the interior of an arc tube -- having -- \*\*\*\* -- and a conductor -- the high-pressure discharge lamp according to claim 1 characterized by consisting of material to which a piece makes a principal component the metal which constitutes the aforementioned metal halogenide

[Claim 4] an iodation scandium encloses with the interior of an arc tube at least -- having -- \*\*\*\* -- and a conductor -- the high-pressure discharge lamp according to claim 3 characterized by consisting of material to which a piece makes a scandium a principal component

[Claim 5] an iodation dysprosium and iodation neodium enclose with the interior of an arc tube at least -- having -- \*\*\*\* -- and a conductor -- the high-pressure discharge lamp according to claim 3 characterized by consisting of material to which a piece makes a dysprosium a principal component

[Claim 6] a conductor -- the high-pressure discharge lamp according to claim 1 characterized by consisting of material to which a piece makes neodium a principal component

[Claim 7] the electrode of a couple, and a conductor -- a piece -- the above -- a conductor -- the time of setting the inter-electrode interval of L and the aforementioned couple to d for an interval with the imagination straight line of a piece which connects the end section and the point of the electrode of the aforementioned couple at least --  $L \geq d$  -- the high-pressure discharge lamp according to claim 1 characterized by being in physical relationship

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#### DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to high-pressure discharge lamps including a high-pressure mercury lamp, a high-pressure xenon lamp, and a metal halide lamp.

[0002]

[Description of the Prior Art] Conventionally, mixed gas, such as mercury and argon gas, and the high-pressure discharge lamp which adds a metal halogenide to them further, encloses in translucency containers, such as quartz glass, is made to discharge, and uses the light have the feature of high brightness and efficient \*\*, begins the object for general lighting, is used for an overhead projector, overhead type projection TV, a projector, etc., and has spread widely.

[0003] The charged pressure of the rare gas which is in the inclination for an arc tube to be more small and for the arc length to become shorter, and is enclosed as gas for starting assistance in order that such a high-pressure discharge lamp may obtain recent years still higher brightness is also in the inclination which becomes higher, in order to shorten build up time of the light at the time of starting. In connection with this, the starting voltage of a lamp also becomes high and the starting characteristic becomes bad. In the high-pressure discharge lamp which has furthermore enclosed the metal halogenide, and the so-called metal halide lamp, since electron capture nature of a halogen is strong, the starting voltage becomes [ electronegativity ] high therefore still more highly with several kV - about about tenkV.

[0004] Therefore, conventionally, the cure which encloses the electron emission nature

matter with an arc tube, and improves the starting characteristic was performed, or at the time of starting, the pulse voltage of the high voltage was repeated to supply voltage many times, was superimposed very much, on it, and the lamp was put into operation as shown in JP,51-66174,A.

[0005]

[Problem(s) to be Solved by the Invention] However, if the electron emission nature matter is enclosed, although radiation will support ionization of the gas inside an arc tube, surely starting voltage will become low and it will become easy to put a lamp into operation with the above-mentioned conventional composition, radiation is [ as opposed to / a human body ] very detrimental also to environment. Therefore, since careful cautions are required to the handling and what has special exclusive use of a manufacturing installation is needed at the time of lamp manufacture, it is disadvantageous in respect of a manufacturing cost.

[0006] Moreover, by repeating a high pulse voltage at the time of starting, and being impressed by the lamp, although a lamp can be put into operation, it is necessary to, take sufficient insulating measures for a lighting device or a lamp on the other hand, therefore equipment turns on a large scale, and for extensive business, it is not practical. Moreover, early degradation of an arc tube may arise by repeating and impressing such a high voltage to a lamp.

[0007] Moreover, in a metal halide lamp, by the reaction of a metal halogenide and quartz glass, the isolation halogen which exists in the interior of an arc tube with lighting time progress increases, therefore starting voltage rises with lighting time progress. For this reason, there was a trouble that the case where the life which a lamp would not carry out [ a life ] a lighting start and was expected before the original lamp life is not acquired arose.

[0008] this invention solves the above-mentioned trouble, and it aims at starting certainly on low voltage and offering a long lasting high-pressure discharge lamp, without enclosing the radioactive substance.

[0009]

[Means for Solving the Problem] the electrode of the couple by which opposite arrangement was carried out in order that this invention might attain the above-mentioned purpose -- having -- the interior of an arc tube -- a conductor -- it is the composition which carried out addition enclosure of the piece

[0010] moreover, the conductor -- a piece consists of material which makes a tungsten a principal component the case where at least one kind of metal halogenide is furthermore enclosed with the interior of an arc tube -- a conductor -- the metal which

constitutes the metal halogenide for a piece consists of material made into a principal component

[0011] moreover, a conductor -- the time of setting the inter-electrode interval of  $L$  and the aforementioned couple to  $d$  for an interval with the imagination straight line of a piece which connects the end section and the point of the electrode of a couple at least --  $L \geq d$  -- it becomes physical relationship -- as -- a conductor -- a piece is arranged inside an arc tube

[0012]

[Function] a conductor -- enclosing a piece -- the electric-field distribution inside an arc tube -- changing -- a conductor -- corona discharge occurs near the edge of a piece By diffusion, the charged particle produced in corona discharge spreads inside [ whole ] an arc tube, and raises inter-electrode conductivity. This corona discharge is generated in applied voltage with inter-electrode applied voltage smaller than the voltage required for inter-electrode to cause dielectric breakdown. Consequently, an inter-electrode dielectric breakdown voltage can fall, can carry out dielectric breakdown of inter-electrode with low applied voltage, namely, can put a lamp into operation.

[0013] moreover, a conductor -- the time of setting the inter-electrode interval of  $L$  and a couple to  $d$  for an interval with the imagination straight line of a piece which connects the end section and the point of the electrode of a couple at least --  $L \geq d$  -- it becomes physical relationship -- as -- a conductor -- if a piece is arranged inside an arc tube, since inter-electrode will serve as a curtailed distance as an electric discharge way -- a conductor -- it is not concerned with the existence of a piece but regular electric discharge (arc discharge) can be induced to inter-electrode further -- this case -- a conductor -- other edges of a piece can be arranged at the place possible near an electrode -- becoming -- therefore -- further -- low applied voltage -- a conductor -- in the one end section, corona discharge occurs easily and can fall the starting voltage of a lamp sharply

[0014] moreover, a conductor -- constituting the tungsten which has high thermal resistance for a piece from material made into a principal component -- a conductor -- the starting voltage of a lamp can be low stopped over a long period of time, without the piece's itself not evaporating in a hot arc, therefore changing a luminescence property

[0015] When enclosing at least one kind of metal halogenide with the interior of an arc tube furthermore a conductor, since starting voltage will fall by corona discharge generating in the metal one end section and a superfluous metal will always exist in the interior of an arc tube rather than a stoichiometry, if the metal which constitutes a metal halogenide for a piece is constituted from material made into a principal

component A halogen uncombinable with a metal though the metal enclosed as a metal halogenide during lighting time progress disappears, i.e., an isolation halogen, does not arise, therefore elevation of the starting voltage of a lamp is prevented with lighting time progress, and a lamp life property can be improved.

[0016]

[Example] Hereafter, the example of this invention is explained, referring to a drawing.

Drawing 1 explains the first example of this invention first.

[0017] Drawing 1 is the cross section of the mercury lamp of the first example of this invention. The electrode of the couple made from a tungsten, and 3a and 3b of the arc tube which 1 becomes from a quartz in drawing 1, and 2a and 2b are imagination straight lines to which in a tungsten line with a diameter of 0.5mm and 11a the first edge of the tungsten line 10 and 11b connect the second edge of the tungsten line 10, 100 connects the nose of cam of electrode 2a and electrode 2b, and a molybdenum wire and 10 are made as for a molybdenum foil, and 4 Moreover, d shows the distance between first edge 11a of the distance between electrode 2a and electrode 2b, the straight line 100 with imagination L1, and the tungsten line 10, and L2 shows the distance between a straight line 100 and second edge 11b. About 2.5 cc and the inter-electrode distance d of the content volume of an arc tube 1 are 5mm, and 45mg of mercury and argon gas 150Torr are enclosed with the interior. Electrodes 2a and 2b are electrically connected to the molybdenum foils 3a and 3b, and the molybdenum foils 3a and 3b are connected to the molybdenum wires 4a and 4b. And the tungsten line 10 is arranged to the arc tube 1 interior so that the interval L of one edge of the tungsten line 10 and a straight line 100 may become longer than the inter-electrode distance d, distance L1 may be set to 5.5mm and distance L2 may be set to 1mm.

[0018] Thus, in the constituted mercury lamp, when voltage was impressed between electrode 2a and electrode 2b at the time of starting, pale feeble luminescence was observed near the first edge 11a of the tungsten line 10, and the second edge 11b. This is considered that corona discharge has occurred near edge 11a and the 11b. Thus, by carrying out addition enclosure, corona discharge generates the tungsten line 10 in an arc tube 1 the first edge 11a of the tungsten line 10, and near the second edge 11b.

[0019] Next, it prepared at a time the mercury lamp of the conventional type which has not enclosed the tungsten line, and ten mercury lamps which carried out addition enclosure of the tungsten line 10 of the above-mentioned this example, respectively, and the starting voltage of these lamps was measured.

[0020] In the result, the direction of the starting voltage of the mercury lamp which enclosed the tungsten line 10 of this example became a low thing from the starting

voltage of the mercury lamp of a conventional type. In the mercury lamp of this example, since this reason is carrying out addition enclosure of the tungsten line 10 to the arc-tube 1 interior, the electric-field distribution of the arc-tube 1 interior changes, electric-field concentration breaks out the first edge 11a of the tungsten line 10, and near the second edge 11b, and, for this reason, corona discharge generates it edge 11a of the tungsten line 10, and near 11b. In corona discharge, an electron and a cation are produced with feeble luminescence, these charged particles spread inside [ whole ] an arc tube by diffusion, the conductivity of the gas of the arc-tube 1 interior is raised, the dielectric breakdown voltage falls, and starting voltage falls.

[0021] The tungsten line 10 seems not to evaporate with a hot arc during lamp stable lighting, since a tungsten has the melting point high about 3400 degrees C. therefore, the conductor enclosed with the arc-tube 1 interior -- there is an advantage of stopping the starting voltage of a lamp low over a long period of time, with constituting a piece from material which makes a tungsten a principal component, without changing a luminescence property

[0022] By the way, although two kinds, the path which connects electrode 2a and electrode 2b, and the path which connects electrode 2a, the tungsten line 10, and electrode 2b, can be considered as an electric discharge way of dielectric breakdown The distance L1 between first edge 11a of a straight line 100 (electrode 2a) and the tungsten line 10 By arranging the tungsten line 10, the path connected directly becomes the shortest and between electrode 2a and electrode 2b carries out dielectric breakdown of electrode 2a and the electrode 2b most easily so that it may be set to 5.5mm with the inter-electrode distance d longer than 5mm. Therefore, it is generated between electrode 2a and electrode 2b, and the arc discharge which follows a dielectric-breakdown row at it does not affect lamp properties, such as lamp voltage, and lamp current or a luminous-intensity-distribution property at the time of stable lighting, by existence of the tungsten line 10. As for the tungsten line 10 which carries out addition enclosure to the arc-tube 1 interior, it is desirable to arrange to the arc-tube 1 interior so that it may become the physical relationship  $L1 \geq d$  Becoming as mentioned above.

[0023] Since the limit imposed on another edge L2 of the tungsten line 10, i.e., the distance between the second edge 11b and straight line 100 (electrode 2b), in this case is furthermore lost, therefore distance L2 can be short-\*\*\*\*(ed) more, strong corona discharge can be easily generated near second edge 11b. Therefore, there is an advantage that dielectric breakdown of between electrode 2a and electrode 2b can be carried out more with low applied voltage.

[0024] In addition, in the limitation in which the distance L2 between second edge 11b

of a straight line 100 (electrode 2a) and the tungsten line 10 has a limited value, although this example explained the case where the relation between distance L1 and the inter-electrode distance d was  $L1 > d$ , even if it is  $L1 \geq d$ , the same effect is acquired. moreover, even if the tungsten line 10 is arranged in a position which are  $L1 \leq d$  and  $L2 \leq d$  or  $L1 > d$ , and  $L2 > d$ , the first edge 11a and near the second edge 11b, it generates and corona discharge comes out not to mention the voltage taken to carry out dielectric breakdown of between electrode 2a and electrode 2b falling

[0025] In addition, in this example, it is clear that the same effect is acquired in the relation between the inter-electrode distance d, the distance L1 between a straight line 100 (electrode 2a) and first edge 11a, and the distance L2 between a straight line 100 (electrode 2b) and second edge 11b even if it is  $L2 \geq d$  and  $L1 < d$ , although the case of  $L1 \geq d$  and  $L2 < d$  was explained.

[0026] in addition, the conductor enclosed with the arc-tube 1 interior in this example -- although the tungsten line with a diameter of 0.5mm was explained to the example for the piece -- a conductor -- you may be other things as long as it consists of material which can bear an elevated temperature of arc discharge like platinum, for example as a piece

[0027] moreover, in this example, although explained to the example, even if it is other high-pressure discharge lamps, such as a high-pressure xenon lamp and a metal halide lamp, it comes out of a mercury lamp not to mention the same effect being acquired

[0028] Next, drawing 2 and drawing 3 explain the second example. It is the property view showing change of the starting voltage accompanying [ are accompanying / drawing 2 / and ] lighting time progress of this metal halide lamp in drawing 3 in the cross section of the metal halide lamp of the second example of this invention.

[0029] In drawing 2, the arc tube which 20 becomes from a quartz, and 30 are scandium foils with a thickness of 0.25mm, and since other composition is the same as the first example, detailed explanation is omitted. Mercury, argon gas, the iodation scandium, and the sodium iodide are enclosed with the arc tube 20, and as further shown in drawing 2, addition enclosure of the scandium foil 30 is carried out. This scandium foil 30 is arranged at a level with the place distant from the imagination straight line 100 which connects the nose of cam of electrode 2a and electrode 2b, and can do it  $L3 = 3\text{mm}$ .

[0030] Operation of the 2nd example constituted as mentioned above is explained. If voltage is impressed between electrode 2a and electrode 2b at the time of lamp starting, corona discharge will occur near the edge of the scandium foil 30. The charged particle produced in corona discharge spreads inside [ whole ] an arc tube by diffusion, and raises the conductivity between electrode 2a and electrode 2b. Consequently, the



dielectric breakdown voltage between electrode 2a and electrode 2b can fall, and a lamp can be put into operation with low applied voltage.

[0031] In order that an iodation scandium might react violently with quartz glass, in the conventional metal halide lamp containing an iodation scandium, the iodine which lost the scandium which the scandium which exists in the interior of an arc tube with lighting time progress of a lamp decreases, consequently is combined, i.e., an isolation iodine, increased, and the starting voltage of a lamp was rising.

[0032] On the other hand, in the metal halide lamp of this example, although addition enclosure of the scandium foil 30 is carried out to the arc tube 20 interior, although this scandium foil 30 does not carry out dissolution, it evaporates slightly in response to the heat of an arc, at the time of lamp stable lighting. For this reason, compared with an iodine, a scandium atom will always exist in the arc tube 20 interior superfluously. Therefore, since the scandium with which the part is always compensated exists even if a scandium disappears at an iodation scandium reacting with quartz glass (arc tube 20) with lighting time progress, an iodine cannot lose the partner who joins together, and can suppress the increase in an isolation iodine, consequently can also suppress elevation of the starting voltage of a lamp.

[0033] Next, the starting voltage of a lamp is explained based on an experimental result the metal halide lamp of this example, and conventionally. Drawing 3 shows change of the starting voltage of iodation scandium-sodium-iodide system 150W metal halide lamp accompanying lighting time progress. The lamp with which (A) in drawing 3 enclosed the scandium foil of this example, and (B) show change of the starting voltage of the conventional lamp which has not enclosed the scandium foil.

[0034] Although starting voltage rose rapidly from the early stages of lighting, starting voltage continued rising also after that and going out occurred after 800-hour lighting with the lamp conventionally so that clearly from drawing 3 That starting voltage is conventionally lower not only than a lamp but also early starting voltage elevation does not have the lamp which enclosed the scandium foil of this example as mentioned above, and even if lighting time passes, starting voltage hardly rises, and going out does not produce after 2000-hour lighting.

[0035] Thus, the metal halide lamp of this example has little change of starting voltage to lighting time progress [ conventionally / a lamp ], and it has the outstanding lamp property.

[0036] Moreover, since a new scandium is supplied by evaporation from the scandium foil 30, even if a scandium disappears at the reaction of an iodation scandium and quartz glass, a luminescence property does not change, therefore the outstanding life

property with little change of a luminescence property is acquired.

[0037] in addition, the conductor which carries out addition enclosure also in another metal halide lamp which has enclosed other metal halogenides although this example explained the iodation scandium-sodium-iodide system metal halide lamp to the example -- if the metal which constitutes the metal halogenide which enclosed the piece is constituted from material made into a principal component, it cannot be overemphasized that the same effect is acquired for example, the conductor which consisted of material which makes a dysprosium a principal component in the iodation dysprosium-iodation neodium-cesium-iodide system metal halide lamp -- a piece -- or the conductor which consisted of material which makes neodium a principal component -- if addition enclosure of the piece is carried out, the same effect as this invention will be acquired

[0038] In addition, although the first example and second example explained the high-pressure discharge lamp of a level lighting formula to the example, you may be the high-pressure discharge lamp of a perpendicular lighting formula.

[0039] As mentioned above, although this invention has explained the desirable example, such a description of not a limited matter but various deformation being possible is natural.

[0040]

[Effect of the Invention] the high-pressure discharge lamp by which opposite arrangement of the electrode of a couple was carried out as mentioned above according to this invention -- setting -- the interior of an arc tube -- a conductor -- the conductor which the electric-field distribution inside an arc tube changed, and was enclosed by carrying out addition enclosure of the piece -- electric field concentrate on the edge of a piece, corona discharge arises, a charged particle is abundantly supplied to the whole interior of an arc tube, and inter-electrode conductivity becomes high Therefore, it becomes possible comparatively on low voltage to put a lamp into operation certainly, without enclosing the radioactive substance, and the high high-pressure discharge lamp of practicality can be supplied.

[0041] moreover, a conductor -- an interval with the imagination straight line of a piece which connects the end section and the point of the electrode of a couple at least serves as physical relationship longer than the inter-electrode interval of a couple -- as -- a conductor -- it connects inter-electrode with arranging a piece -- as -- electric discharge -- it can induce -- consequently, a conductor -- other edges of a piece become possible [ arranging at the place possible near the electrode from which more powerful corona discharge is acquired ], and can fall the starting voltage of a lamp sharply Therefore, a

lamp can be put into operation, without repeating and impressing high voltage, and the miniaturization of a lighting device is attained.

[0042] moreover, a conductor -- constituting the tungsten which has high thermal resistance for a piece from material made into a principal component -- a conductor -- without the piece's itself not evaporating in a hot arc, therefore changing a luminescence property, the starting voltage of a lamp can be low stopped over a long period of time, and an economical high-pressure discharge lamp can be supplied

[0043] When enclosing at least one kind of metal halogenide with the interior of an arc tube furthermore a conductor, while starting voltage will fall by corona discharge generating in the metal one end section, if the metal which constitutes a metal halogenide for a piece is constituted from material made into a principal component Since a metal more superfluous than a stoichiometry will always exist in the interior of an arc tube, the metal halide lamp which has the right starting characteristic which an isolation halogen did not arise, therefore was stabilized till the life last stage, and does not have change of a luminescence property can be offered.

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[Translation done.]